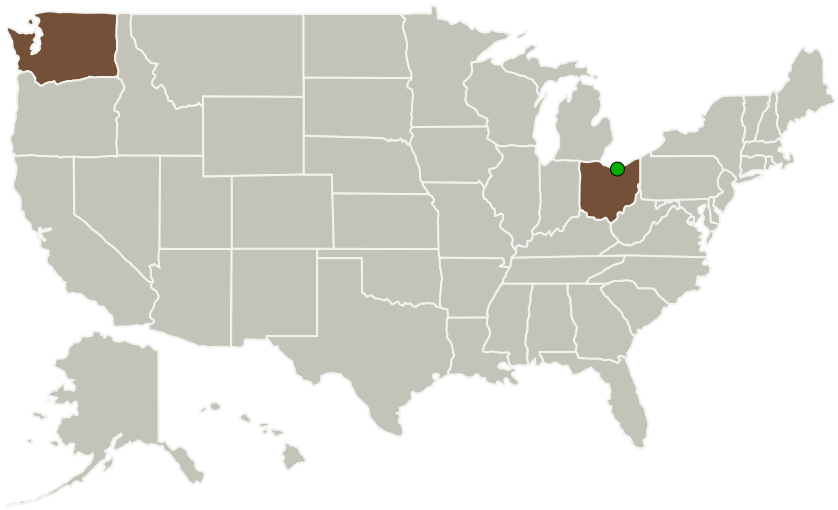
Cavitation Peening of Aerospace Bearings, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

High-value bearings are a critical part of the safety, reliability, cost and performance of modern aircraft. A typical passenger jet will have 100 to 175 high-valve bearings costing from $2,500 to $50,000 each for a total aircraft cost of $300,000 to $600,000. All gas turbine engine bearings are inspected at overhaul and typically 30-40% of there are rejected. For each engine overhaul, bearing replacement costs on average $100,000. Any process that increases bearing performance and reliability will have a commensurate effect on aircraft safety, reliability, performance and operating cost. Ormond is proposing to use a novel surface enhancement process, cavitation peening, to impart deep, high magnitude residual stresses without roughening the bearing such as to significantly enhance bearing life, reliability and performance. Cavitation peening uses ultra-high pressure water jets to generate intense clouds of cavitation bubbles that collapse on the work piece generating shock waves that cold work the material. No particles are used, the process produces no waste, adds no weight to the part and is very inexpensive. The new technology is currently being evaluated by Boeing, Sikorsky, Bell and Rolls-Royce for aerospace applications and is proving particularly effective for gears. A 20% improvement in bearing life is targeted. This project would generate the residual stress and fatigue data for bearings to convince stakeholders of the value of the technology for this application.

Primary U.S. Work Locations and Key Partners



Cavitation Peening of Aerospace Bearings Project Image

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Organizations Performing Work	Role	Type	Location
Ormond, LLC	Lead Organization	Industry	Auburn, Washington
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Washington

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140513)*

Images

Project Image
Cavitation Peening of Aerospace Bearings Project Image
(https://techport.nasa.gov/image/135790)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Ormond, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

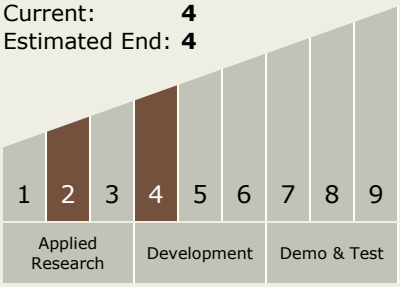
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Tom Butler

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.7 Mechanism Life Extension Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System